Language switching in bilinguals: Understanding of Bilinguals' Language Production

B014007

MSc Psychology of Language

The University of Edinburgh

2012

Table of Contents

Abstract

I report three experiments that examined whether bilingual speakers sometimes use the grammar of one language and the words from the other language. In the non-switch conditions in experiment 1 and 2, participants described pictures using nouns and adjectives from the same language. In the switch conditions, they used nouns and adjectives from the other language. In Experiment 3, in the switch conditions participants used only the adjectives of noun phrases from the other language. In the non-switch conditions, they used both nouns and adjectives from the same language. I manipulated whether they sometimes used the syntactic properties of adjectives from the other language. The results showed that both grammars of the two languages were activated during bilingual language production. The effect of the grammar of the other language increased in the switch conditions. More inappropriate responses observed when switching from bilinguals' L2 to L1. I interpret the results in terms of Hartsuiker and Pickering's (2008) integrated model of syntactic representation.

1-Introduction

Bilingual speakers know two different languages and hence they know two different grammatical systems. For example, a Persian-English bilingual speaker knows that Persian uses postnominal adjectives (adjectives follow nouns) while English uses prenominal adjectives (adjective precede nouns). Although much evidence has led researchers to assume that the two languages are activated during lexical processing, a fundamental question is whether such parallel activation of the two languages leads to interference (Hatzidaki, Branigan and Pickering, 2011). One group of researchers assumes that although the two languages are activated during sentence production, the non-target language does not affect the target language. For example, La Heij(2005) considers the intended language as part of the preverbal message that acts as language cue. It ensures that lexical items in the intended language reach a higher activation level than their equivalent translations in the non intended language. The second group of researchers suggests that the non-target language activation can influence lexical processing in the target-language. For example, in Costa, Roelstraete and Hartsuiker(2006) the lexical bias effects (LBE) suggest that feedback existing in second-language production extends across the two languages of a bilingual speaker. The researchers conclude that even when only one language is used, representations of both languages are recruited in bilingual language processing.

1-1- The present study

In this project, I investigate whether the two different grammatical systems of bilingual speakers are entirely kept separate during language production or whether some times; the syntactic features of one language (the non-target language) affect the other language (the target-language). The main study questions are:

-first, how bilinguals produce single-language utterances and utterances involving language mid-utterance? For example, do they sometime use the grammar of one language and the words from the other language?

- second, what do the results suggest about the way in which languages are represented?

- finally, I investigate how the results of the present study might be captured within a model of adjective-head noun/head noun-adjective in bilingual language production and how such a model might be integrated with Hartsuiker and Pickering's (2008) integrated model of syntactic representation.

Adjective placement is suitable for the purpose of study, because in Persian uses adjectives postnominaly while English generally uses adjectives prenominaly. I report three experiments. All three experiments include switching tasks. Since I want to examine whether bilingual speakers

sometime use the grammar of one language and the words from the other language, it seems that language switching tasks are suitable for the purpose of study, because when a bilingual speaker switches between the two languages, he has to consider using two different grammatical systems in a single utterance.

Consistent with Hatzidaki, Branigan and Pickering (2011), I hypothesize that since the two languages of bilingual speakers are activated during language production, the grammatical system of the non-target language might affect the production of the target language. Moreover, it is hypothesized that more inappropriate responses are made in tasks involving switching (i.e., in bilingual contexts) than in unilingual contexts involving no switching. In other words, more inappropriate NA constructions would be produced in the English-Persian and Persian-English sets of items (bilingual contexts) than in the English and Persian sets of items (monolingual contexts), because in the switch conditions the two languages of a bilingual speaker must be inevitably activated and that both languages are activated to a greater degree than in the non-switch conditions. This might lead to more syntactic interference.

I basically examine whether the activation of adjective placement rule from the non-source language might affect the syntactic process of word order in the source language. If the grammatical feature of the non-target language affected the target-language, this would give evidence to suggest that bilingual's two language systems interfere during language process.

1-2 – Code switching as a research topic

Code switching (henceforth CS) which is defined as a change from one language of a bilingual speaker to another in the same utterance or conversation (Hamers and Blanc, 1989) is a common language phenomenon that occurs in bilinguals' speech production. Example (1) shows CS between English and Spanish:

(1) "I want a motorcycle <u>verde</u>.

…… Green.

I want a green motorcycle". (McClure,1981:87)

CS phenomenon has widely been discussed in a variety of fields. In comparison with all other contact phenomena of interest to researchers of bilingualism, CS has arguably dominated the field (Bullock and Toribio,2009). Nilep (2006: 1) reports that "a search of the Linguistics and Language Behavior Abstracts database in 2005" demonstrates that more than 1,800 articles on CS published in every branch of linguistics. The main introduction to CS dates back to Blom and Gumperz's(1972) study, Gross (2006). In sociolinguistic approaches to CS, the main aim has been to find motivations

for CS in bilingual speech communities. In other words, sociolinguistic approach investigates why bilingual speakers choose to engage in CS in both bilingual and unilingual modes (Gross, 2006).

According to Karousou-Fokas and Garman (2001), recent psycholinguistic research on aspects of bilingual production has focused on general modelling issues (e.g., De Bot & Schreuder, 1993), control of processing (e.g., Green, 1993, 1998), and the formulation of output (e.g., Myers-Scotton, 1993). In all approaches, CS data is regarded as an important source of evidence. Since CS provides valuable information about the nature of language production (e.g., lexical access in bilingual language production), it has become a research topic in psycholinguistic studies. For example, CS studies can help psycholinguists to find whether one of the languages is deactivated while the other language is being activated and "how incoming signals are channelled to their appropriate decoding system for interpretation (e.g. input switch)" (Paradis, 1993:135). What makes psycholinguistic studies on CS absolutely necessary is that while CS follows most of the same language processing principles applying to monolingual data, such principles do not suffice to explain the CS phenomenon.

1-3- Main specific properties of bilingual language production

Language production has been one of the main research topics in psycholinguistic studies. In late 1960s, the systematic study of language production started when corpora of spontaneous speech errors were collected and analyzed by psycholinguists (Levelt, 1999). Much research on language production (e.g. Levelt, 1989; Dell, 1986) follows a framework that includes three different processing components or 3 levels of representations: the conceptual level creates nonverbal or preverbal message. The preverbal message contains one or more than one concept for which there are words in the lexicon (Levelt,1999). Then, the words for the concepts are retrieved as well as the words' grammatical properties. The second component is called grammatical encoding. Grammatical encoding involves the selection of words that are semantically appropriate (by locating lexical entries or technically by locating lemmas in the mental lexicon). It also encompasses "the assignment of the appropriate lemmas to roles in a syntactic structure" (Bock,1996:395). Finally, at phonological encoding level, lexeme, the morphological and phonological properties of the words are represented.

While most of the bilingual language properties follow the same language processing principles applying to monolingual language processing, some of the properties are specific to bilingual language processing. Such specific properties must be taken into account in studies on bilingual language processing. Below, I investigate three of them (language selection, lexical selection and language contact phenomenon). At the conceptual level, both monolingual and bilingual speakers map their intentions to speak onto language (Carota, et al,2009). While both groups of speakers consider the same choices (e.g., dialectical or stylistic choices), only bilingual speakers decide either the

utterance will be in language A or unilingual in language B (See La Heij, 2005). Even De Houwer (2006) goes further claiming that for every utterance a bilingual speaker produces, he/she decides whether it will be in language A, language B(Alpha) or mixed in which elements from the two languages are combined. Thus, as Kroll et al. (2006) state, at least one critical respect that differentiates bilingual planning for speaking from monolingual planning for speaking is that a bilingual speaker must select the language of production(See Pickering and Ferreira, 2008). In fact, only in a bilingual speaker and not in a monolingual speaker, the conceptualizer determines which language is most appropriate to the conversation and it activates elements of that language system in the same way that it determines the appropriateness in a given context (Paradis, 2004).

A second difference is that while researchers consider language-specific versus language-nonspecific activation accounts in bilingual language processing (Hartsuiker, Schoonbaert, and Pickering, 2006; Costa,2005) such accounts are not considered in monolingual language processing. In fact, the two hypotheses- the language-specific selection hypothesis and the language-nonspecific selection hypothesis-were proposed to examine whether in bilingual language production lexical nodes from the nonresponse language act as competitors(See Costa,2005).The first hypothesis suggests that the mechanism encompassing the lexical selection is ‘‘blind to the activation levels of the lexical nodes”(Costa,2005:313) that belong to the non-target language. This means that only lexical nodes belonging to the target language are candidates for lexical selection. The latter hypothesis assumes that the mechanism encompassing the lexical selection only selects the lexical node having the highest level of activation regardless of which language (the response language or the non-response language) it belongs to(Costa,2005). Therefore, the language-nonspecific selection hypothesis assumes that bilingual lexical selection pursues a competitive process.

A third difference lies in the co-activation of both languages of a bilingual speaker during language processing. Compelling evidence from psycholinguistic studies (See Schwartz el al.,2007, for a review) on bilingual’s speech production has led the researchers to suggest that both languages of a bilingual speaker are activated even when only one language is used, Bob et al.(2008). In other words, the two languages do not function as an on-off model (Bob, et al.,2008; Kroll, et al., 2008). The co-activation of both languages leads to a different processing in bilingual language production. For example, due to the parallel activation of the two languages, linguistic contact phenomena such as interference and CS occur in bilingual language production. Such properties of bilingual language processing have led psycholinguists not to consider bilingual speakers as only the sum of two monolinguals but as specific speakers who have developed an equal competence but different in nature, to that of monolinguals (Grosjean, 1998).

1-4- Background

1-4-1- Code switching: a site for investigating bilingual language production

Hatzidaki, Branigan and Pickering (2011) examined whether lexical co-activation influenced syntactic processing in English-Greek highly proficient bilinguals. Hatzidaki, et al. (2011) investigated whether the number feature activation in the non-target language might influence grammatical processes of subject-verb agreement. Using sentence completion task, the researchers conducted four experiments. Participants first read a subject NP in English or Greek. Then they completed sentence fragments in the same language or the other language. Basically agreement following convergent nouns and divergent nouns were compared. If nouns had identical syntactic number in Greek and English, they were classified as convergent (e.g., tree is singular in both languages). But if nouns had different syntactic number in Greek and English, they were classified as divergent (e.g., money is singular in English while its translation equivalent in Greek is plural). The results of the study revealed that during both one-language and two-language conditions, the grammars of both languages (English and Greek in their study) were activated. The non-target language affected the production of target-language.

In four experiments, Kootstra, et al. (2010) examined the role of alignment and shared word order with a dialogue partner in sentence production in the switching conditions. In Experiments 1(Dutch to English switching) and 2(English to Dutch switching), using shared or not shared word order, Dutch-English bilingual speakers code switched in order to describe pictures. In a confederate-scripted dialogue condition in Experiments three and four the same task was used. Kootstra, et al., (2010) reported that when participants switched, they showed a strong tendency toward using the shared word order rather than the non-shared word order. In switches to English, they tended to use the SVO string. In addition, participants tended to align their choices of word order and their patterns of switching with their confederates. The researchers found that the combination of cross-language word order equivalence (i.e., shared-non-shared word order) and structural priming affected the production of code-switches in sentences.

Selles(2011) reports two experiments that investigated whether the different NP structures in Spanish and English would affect the way in which Spanish-English bilingual speakers described pictures. In both experiments, there were two different tasks: one language-tasks and two-language tasks. The results of the study support the parallel activation of the two languages during language production.

1-4-2- Cross-linguistic syntactic priming

While much research in psycholinguistics was conducted to examine the universality of mechanism in language processing, only few studies have directly addressed the issue of how language processing

is acclimatized to the existence of two languages, Schwartz and Kroll(2006). One type of the experiments conducted recently to investigate the issue is priming paradigm. Researchers investigate whether priming effect that typically facilitates language production within language also has the same function across languages (e.g., Loebell & Bock, 2003). The main aim of research in Bernolet, Hartsuiker, and Pickering (2007) was to investigate whether cross-linguistic priming occurs in sentences in which adjectives are used in relative clauses (e.g., the book that is brown) or adjectives used in noun phrase constructions (e.g., a red ball). The researchers reported five experiments in which within- and between-languages priming effects in sentences with relative clause constructions in Dutch, English, and German were examined. The results of the study showed that cross-linguistic priming occur only when the two languages of bilinguals have the same structures. But as the results of experiments 3a, 3b and 4 showed, when structures in both languages do not share identical word order (e.g., relative clause structure in Dutch and English) one would not prime the other.

Using the syntactic priming phenomenon, Hartsuiker, Pickering, and Veltkamp (2004) examined the shared-syntax account. Spanish-English bilingual participants were asked to describe cards to each other. The researchers found that they were more likely to use English passive sentences after they heard a Spanish passive sentence than a Spanish active sentence. The result of the study was different from Loebell & Bock's (2003) study. To explain why the results of their study contrast with Loebell & Bock's (2003) study, in which no priming effect reported between German and English passives (in either direction), Hartsuiker, Pickering, and Veltkamp (2004) state that passive structure has the same word order in English and Spanish. In both languages (English and Spanish) participle precedes the by-phrase, while in German it follows the by-phrase.

1-4-3- Modelling bilingual language production

An integrated bilingual language production model was presented in Hartsuiker, Pickering, and Veltkamp (2004). The model is basically an extension of the model proposed in Pickering and Branigan's (1998). Hartsuiker, Pickering, and Veltkamp (2004) proposed that bilingual speakers have an integrated lemma stratum. Each lemma node (e.g.,eat) is linked to one conceptual node (EAT(X,Y)) at the conceptual stratum to one category node (Verb in the case of eat), to combinatorial nodes (such as active or passive), and to one language node, Hartsuiker and Pickering (2008). The integrated network includes shared syntax and lexicon. A straightforward way of explaining the language integration (e.g., CS) occurring in bilingual language production was provided by the model. Cross-linguistic grammatical effects and lexical switching are predicted in this model, because according to this account, both the meaning and syntax of the words are points of contact across languages, Hartsuiker, Pickering, and Veltkamp (2004).

Hartsuiker and Pickering (2008) examined the extent to which processes are integrated or they are kept separate between the two languages of a bilingual speaker in their sentence production. A more detailed explanation of Hartsuiker et al.'s (2004) model was provided in Hartsuiker and Pickering (2008) as well. The researchers considered three different accounts of bilingual language productions proposed in De Bot (1992), Hartsuiker et al. (2004) and Ullman(2001). They conclude that evidence from studies on bilingual language production supports Hartsuiker et al.'s (2004) prediction that the two languages of a bilingual speaker affect each other at syntactic level.

Based on the Levelt's (1989) model, De Bot(1992) proposed a bilingual model of language production. In this model, every language possesses its own formulator for both morpho-phonological and lexical knowledge. Bilingual speakers have a shared lexicon between the two languages. The meaning is not language-specific. Thus the meaning could be shared by two languages of a bilingual speaker. The model assumes that proficiency has a critical role in having a separate or jointly stored system of the two languages. At the phonological encoding level, sounds that are language-specific develop their own norm, but similar sounds in the two languages of a bilingual speaker are represented by one single norm.

2- Experiments

The present study consists of three experiments in which syntactic interactions between the two languages of bilingual speakers are investigated. All experiments consist of two conditions (the switch and non-switch conditions) and four different sets of items: the Persian set, the Persian-English set, the English set and the English-Persian set. The Persian and English sets of items represent the non-switch conditions and the Persian-English and English-Persian sets of items represent the switch conditions. In experiment 1, in the non-switch conditions, participants described the pictures using a noun and an adjective of the same language. In the switch conditions, participants described the pictures using a noun and an adjective from the other language. In Experiment 2, in the switch conditions, to describe the pictures, participants used the translation-equivalents of the noun phrases printed above the pictures. In the non-switch conditions, they used the nouns and adjectives of the same language to describe the pictures. In Experiment 3, in the switch conditions participants used only the adjectives of noun phrases from the other language. In the non-switch conditions, they used both nouns and adjectives from the same language.

3- Experiment 1: Sentence completion task 1

3-1- Method

3-1-1-Participants

Participants were recruited through advertisements which clearly stated proficiency in both Persian and English as prerequisite. They were paid six pounds for their participations. Participants were Persian-English speakers. Eighteen of them were doing PhD at Heriot-Watt University or Edinburgh University. Their self-ratings of their English language skills (speaking and listening) and the English proficiency test results demonstrated that the participants were fluent in English. The median age of the participants was 29 years (range 9- 62) with a median length of residence of 8 years (range 2–36) in UK. I had 11 female participants. Table 1 shows the participants' background characteristics in experiments 1, 2 and 3.

Table 1

Participants' characteristics in experiments 1, 2 and 3

Measures	EXP1 N=36	EXP2 N=37	EXP3 N=29
Age	30.5	29.72	29.20
Self-rated speaking ability in English (seven-point scale)	5.55	5.59	5.55
Self-rated listening ability in English (seven-point scale)	5.69	5.72	5.62
English language proficiency test mark(the highest score: 25)	21.75	21.86	22.06
Years of English language use in daily life	8.62	8.87	8.77
Self-reported amount of code-switching (five-point scale)	2.52	2.53	2.61

Note: EXP: Experiment, N: number of participants

3-1-2- Materials

I created 32 sentence fragments. The 32 sentence fragments included 8 items from the Persian set, the English set, the Persian-English set, and the English-Persian set. In each trial, one of the cases-object(e.g., The cat eats the small mouse), benefactor(e.g., The moisturising cream is excellent for dry skin), instrument (e.g., He cut his finger with a sharp knife) or location (e.g., She was sitting on a wooden chair)- was omitted. Thirty-two unique pictures were presented in the place of omitted objects. Green outlined pictures were used for the Persian set. Green outlined background colour showed that Persian should be the response language. Then a mixture of 8 green outlined pictures with 8 Persian sentence fragments was used for the Persian set. Orange outlined pictures were used

for the English set. Orange outlined background colour showed that English should be the response language. Then a mixture of 8 orange outlined pictures with 8 English sentence fragments was used for the English set. I created the English-Persian set by combining English sentence fragments with green outlined pictures. I created the Persian-English set by combining Persian sentence fragments with orange outlined pictures. In language switching studies, it is common to use the background-color-cueing procedure (e.g., Broersma, 2011; Kootstra et al.,2010; Costa & Santesteban, 2004; Meuter & Allport, 1999).

I provided 2 lists of 32 items. Basically, I provided 16 Persian sentence fragments and I used the English translations of the sentences for the English set. The pictures were identical in all sets(See Appendixes A & B). I provided 16 Persian-English sentence fragments and I used the English translations of the sentence fragments for the English-Persian set. Each list contained 8 items from the Persian set, the English set, the Persian-English set, and the English-Persian set. Then Experiment 1 included 16 switch conditions and 16 non-switch conditions. Table 2 shows sample items used in Experiment 1. Since the English sentence fragments were basically translations of the Persian sentence fragments, I arranged the lists so that not each participant received two semantically identical items. I used spoken language form for the Persian and the Persian-English sets.

Table 2

Sample items used in Experiment 1

Sets of items	Sample items
The Persian set	مینا  رو برام آورد.*
The Persian-English set	مینا  رو برام آورد.
The English set	**Judy carried the**  **for me.**
The English-Persian set	**Judy carried the**  **for me.**

Note: The table shows the basic design used in Experiment 1. Two semantically identical items were not used in a single list. * Mina carried the ..... for me.

There is concern that different classes of adjectives may work differently (Sobin, 1984). This work deals with varieties of adjectives (e.g., colour, feeling, appearance, shape, size) as opposed to Sobin (1984) in which only colour adjectives were dealt with(See Appendixes A & B).

3-1-3-Procedure

Before doing the experiments, participants were asked some demographic questions including name, age, sex and number of years of English language use in daily life. Prior to the experiments, participants were given 4 practice trials in order to familiarize themselves with the experimental tasks. Instructions were basically given in Persian. Participants were informed that their speech would be recorded. Participants were asked to use a noun and an adjective to describe the pictures presented in the place of omitted objects. By doing that, they completed 32 sentence fragments. While green outlined pictures showed that Persian should be the response language, orange outlined pictures showed that English should be the response language. Therefore, in the non-switch conditions, if the sentence fragments were in Persian and the pictures had a green background colour, participants had to use Persian to complete the sentence fragments. In the switch conditions, when the sentence fragments were in Persian and the pictures had an orange background colour, they had to use an English noun and adjective to complete the sentence fragments. In the same way**,** if the sentence fragments were in English and the pictures had a green background colour, participants had to use Persian nouns and adjectives to complete the sentence fragments. They were told that there was no preferable way of doing the tasks.

To rate the participants' English language proficiency, I created a 25-item cloze test (See Appendix E). Participants were instructed to fill in the blanks with the most appropriate English words. They were instructed that they had a limitation of 10 seconds for each item.

3-1-4- Scoring and data analysis

Three different categories were used to score participants' responses. Responses were scored *appropriate* when participants completed the sentence fragments as requested(using adjective+noun word order when English is the response language and using noun+adjective word order string when Persian is the intended response language). Responses were scored *inappropriate* when they did not complete the sentence fragments as requested. For all other completions, responses were scored *other*. For example, if participants failed to complete a sentence fragment, it would be scored as *other*. In addition, all responses had to include a noun phrase structure (a noun and an adjective). All other utterances (e.g., a lot of books) used to describe the pictures were scored as ''other'' and omitted from the analyses. Those responses in which there were a bit delay but included nouns and adjectives

within noun phrase structures were not scored as ‘‘other’’ but they were counted as acceptable responses.

Similar to Hatzidaki, et al. (201l) and Selles(2011), I used a linear mixed effect so as to test whether inappropriate responses were affected by language task in the switch and non-switch conditions, language proficiency, source language, target language, and participants' self ratings of their speaking and listening skills. Using appropriate and inappropriate responses as the dependent variables and experimental items and participants as random effects, first I provided a null model. To find the model with the best fit, predictors were added to the model individually. Then using χ^2-tests the models were compared to see whether adding the predictors contributed significantly to the model.

3-2- Results

Overall, 1152 sentence fragments consisting of 576 switched and 576 non-switch utterances were completed by the participants. There were 10 (0.86%) "other" responses and they were discarded from the analysis. Then analysis is based on the remaining 1142 sentence fragment completions.
The results of Experiment 1 showed that appropriate responses occurred much more frequently (98%) than inappropriate responses. In other words, only (1.57%) of the responses was scored as inappropriate. Appropriate responses occurred more frequently (99%) in the non-switch conditions than in the switch conditions (96%). In addition, the results demonstrated that inappropriate responses occurred much more frequently (78%) in switches from L2 to L1 than from L1 to L2. Table 3 reports the participant's responses per condition.

Table 3

Experiment 1: Participant's responses in the switch and non-switch tasks

LT	**Responses**				
	Sum	Appropriate	Inappropriate	Omission	%Inappropriate
Non-switch tasks	576	570	4	2	%22.2
Persian	288	283	4	1	%100
English	288	287	0	1	%0.0
Switch tasks	576	554	14	8	%78.57
Persian-English	288	280	3	5	%21.42
English-Persian	288	274	11	3	%78.58

Note: LT: Language Task, Omission: responses scored as other, %inappropriate: the percentage of inappropriate responses (responses scored as Other were not included)

Using a linear mixed effect model, I created a baseline model using participants and items as random effects. I incrementally added predictors to the base line model and I conducted χ^2-tests to

determine which of the predictors attributed to the model of best fit (See Table 4). I tested language task, target language, and source language individually as predictors. Language task and target language were individually significant but source language was not significant. Finally, I added both language task and target language as predictors to the base model, and the results were highly significant. χ^2-tests showed that the model of best fit used language task and target language as predictors.

Table 4

Models of responses in Experiment 1

Predictor	Estimate	Standard Error	z value	*p*
Language task as main predictor: $\chi2(1) = 5.618$, $p = .018$, $N = 1142$				
(Intercept)	-10.445	1.727	-6.049	< .001
Language task	1.479	0.685	2.159	0.031
Target Language as main predictor: $\chi2(1) = 8.578$, $p = .003$, $N = 1142$				
(Intercept)	-5.646	1.536	-3.675	< .001
Target Language	-1.846	0.723	-2.552	0.011
Language Task and Target Language as predictors: $\chi2(1) = 15.601$, $p < .001$,N=1142				
(Intercept)	-8.284	1.938	-4.275	< .001
Language Task	1.508	0.642	2.349	0.019
Target Language	-1.899	0.706	-2.689	0.007

To test to see whether language proficiency put an effect on responses, I added further predictors based on the rating of the participants' proficiency levels. From the Cloze test results and from self rated speaking and listening skills, I added language proficiency, self rating of speaking skill and self rating of listening skill individually to the model of best fit which neither improved the model.

3-3- Discussion

In sum, the results of Experiment1 demonstrated that both in the switch and non-switch conditions, the word order of the intended language was a strong predictor of the linguistic behaviour of the participants. Participants showed a very strong preference to the appropriate word orders in noun phrase structures both in the switch and non-switch conditions. In other words, in most cases, the noun+adjective word order string was used when Persian was the intended response language and the adjective+noun word order string was used when English was the intended response language.

However, the results revealed that at noun phrase levels, the syntax of other language affects language production of bilingual speakers. For this reason, participants sometimes selected the adjective placement feature from the other language. The results showed that both languages of bilingual speakers are co-activated during language production. Responses were not affected by participants' levels of language proficiency.

4- Experiment 2: Sentence completion task 2

To get a better picture of the nature of the syntactic processing in CS, an additional sentence completion task (Experiment 2) was designed. Experiment 2 investigated whether the same results would occur in a different task in which in the switch conditions participants had to use the translation-equivalents of the noun phrases printed above the pictures.

4-1- Method

4-1-1-Participants

Thirty-seven participants took part in Experiment 2. Thirty-six of them were from the same population as Experiment 1. Table 1 demonstrates the participants' characteristics.

4-1-2- Materials

Thirty-two sentence fragments were created. As in Experiment 1, the 32 sentence fragments included 8 items from the Persian set, the English set, the Persian-English set, and the English-Persian set. Then Experiment 2 consisted of 16 switch trials and 16 non-switch trials. In each trial one of the cases (e.g., object, benefactor, instrument or location) was omitted. Thirty-two unique pictures were presented in the place of omitted objects. The difference between the switch and non-switch trials is that for the switch conditions, noun phrases from the same language were printed above the target pictures. As in Experiment 1, I provided 2 lists of 32 items for Experiment 2(See Appendix C for list 1). Basically, I provided 16 Persian sentence fragments and I used the English translations of the sentences for the English set. The pictures were identical in all sets. Each list contained 8 items from the Persian set, the English set, the Persian-English set, and the English-Persian set. Table 5 shows sample items used in Experiment 2. Since the English sentence fragments were basically translations of the Persian sentence fragments, I arranged the lists so that not each participant received two semantically identical items.

Table 5

Sample items used in Experiment 2

Sets of items	Sample items
The Persian set	دیشب اون خانم تو مهمونی  پوشیده بود*.
The Persian-English set	دیشب اون خانم تو مهمونی دامن کوتاه  پوشیده بود .
The English set	**The lady was wearing a**  **at the party.**
The English-Persian set	**The lady was wearing a** tight skirt  **at the party.**

Note: The table shows the basic design used in Experiment 2. Two semantically identical items were not used in a single list. * Last night, the lady was wearing a ..... at the party.

4-1-3-Procedure

Prior to the experiments, participants were given 4 practice trials in order to familiarize themselves with the experimental tasks. Instructions were basically given in Persian. Participants were informed that their speech would be recorded. Participants were instructed that for 16 switch conditions they first read the noun phrases printed above the target pictures. To describe the pictures, they had to use the translation-equivalents of the noun phrases printed above the target pictures. For the non-switch trials, participants were instructed to describe the pictures using nouns and adjectives from the same language.

4-1-4- Scoring and data analysis

The scoring and data analysis were identical to that of Experiment 1.

4-2- Results

Overall, 1185 sentence fragments consisting of 592 switched and 592 non-switched utterances were completed by the participants. There were 10 (0.84%) "other" responses and they were discarded from the analysis. Then analysis is based on the remaining 1175 sentence fragment completions. The data show that the global pattern of responses was identical to those in Experiment 1. Similar to Experiment 1, in most cases (98%) participants selected the correct word order. The results showed that appropriate responses occurred much more frequently (98%) than inappropriate responses (2%). Participants produced more appropriate responses (99%) in the non-switch conditions than in the switch conditions (96%). Table 6 shows participant's responses per condition. The results revealed that inappropriate responses occurred much more frequently (89%) in switches from L2 to L1 than from L1 to L2.

Table 6

Experiment 2: Participant's responses in the switch and non-switch tasks

LT	**Responses**				
	Sum	Appropriate	Inappropriate	Omission	%Inappropriate
Non-switch tasks	592	582	1	9	%5
Persian	296	292	0	4	%0
English	296	290	1	5	%100
Switch tasks	592	572	19	1	%95
Persian-English	296	293	2	1	%10.52
English-Persian	296	279	17	0	%89.47

Note: LT: Language Task, Omission: responses scored as other, %inappropriate: the percentage of inappropriate responses (responses scored as Other were not included)

I calculated results for Experiment 2 the same way as Experiment 1. Target language and source language were individually significant but language task was not. When target language and source language were both added as predictors they had significant effects on model. Like Experiment 1, χ^2-tests were conducted to determine model of best fit (See Table 7). With the χ^2-tests it was found that the model with source language and target language as predictors was the model of best fit. I added language proficiency, self rating of speaking skill and self rating of listening skill individually to the model of best fit. Similar to Experiment 1, neither language proficiency, nor self rating of speaking skill, nor self rating of listening skill improved the model.

Table 7

Models of responses in Experiment 2

Predictor	Estimate	Standard Error	z value	*p*
Target Language as main predictor: $\chi2(1) = 7.995$, $p = .005$, $N = 1174$				
(Intercept)	-5.106	1.807	-2.826	0.005
Target Language	-2.680	1.148	-2.336	0.020
Source Language as main predictor: $\chi2(1) = 7.997$, $p = .005$, $N = 1174$				
(Intercept)	-13.145	2.431	-5.406	< .001
Source Language	2.680	1.147	2.336	0.020
Source Language and Target Language as predictors: $\chi2(1) = 19.318$, $p < .001$, $N = 1174$				
(Intercept)	-9.009	2.127	-4.237	< .001
Source Language	2.568	0.838	3.064	0.002
Target Language	-2.567	0.838	-3.064	0.002

4-3- Discussion

The main aim of doing Experiment 2 was to examine whether a different language task (a translation task) affects the participants' responses. In the switch trials participants had to use the translation-equivalents of the noun phrases printed above the pictures in order to describe the pictures. In the non- switch trials, however, they had to use nouns and adjectives from the same language. The results showed that as Experiment 1, in most cases participants chose the requested word order. It means that in most cases, they used the noun+adjective word order string for Persian and the adjective+noun word order string for English. As the data here show, participants made only few inappropriate responses both in the switch and non-switch conditions. The results revealed that at noun phrase levels, the syntax of other language affects syntactic processing in the target-language. For this reason, participants sometimes selected the adjective placement feature from the other language. As Experiment 1, inappropriate responses were not affected by participants' levels of language proficiency.

5- Experiment 3: Sentence completion task 3

To get a better picture of the nature of the bilingual lemma level, now I need to examine whether bilingual speakers sometime use the grammar of the other language when they have to use only

adjectives of noun phrases and more interestingly, whether syntactic interference enhances when only adjectives from the other language must be used in the switch conditions. The same design as Experiment 1 was used in Experiment 3 but in the switch conditions.

5-1- Method

5-1-1- Participants

Participants were 29 members from the same population as Experiment 2. Table 1 reports the participants' characteristics.

5-1-2- Materials

Experiment 3 used the same design as Experiment 1(See Appendix D).

5-1-3- Procedure

Prior to the experiment, participants were given 8 practice trials in order to familiarize themselves with the experimental task. As Experiment 1 and 2, instructions were given in Persian. Participants were informed that their speech would be recorded. They sat in front of the same laptop and completed the sentence fragments. To describe the pictures in the switch trials, participants were instructed to use only adjectives of noun phrases from the other language. In the non-switch trials they had to describe the pictures using the adjectives and nouns from the same language. As Experiment 1, they were instructed that green outlined pictures showed that Persian should be the response language. Orange outlined pictures showed that English should be the response language. The procedure in the non-switch conditions was the same as Experiment 1. Therefore, in the non-switch conditions, if the sentence fragments were in Persian and the pictures had a green background colour, participants had to use Persian nouns and adjectives in order to complete the sentence fragments. When the sentence fragments were in English and the pictures had an orange background colour, they had to use English adjectives and English nouns. In the switch conditions, when the sentence fragments were in English and the pictures had a green background colour, they had to use Persian adjectives and English nouns in a noun phrase structure to complete the sentence fragments. But when the sentence fragments were in Persian and the pictures had an orange background colour, participants had to use English adjectives and Persian nouns. They were told that there was no preferable way of doing the tasks.

5-1-4- Scoring and data analysis

Basically, scoring and data analysis were similar to that of Experiment 1 and 2 except that responses were scored *appropriate* when participants used the correct adjective placement rules of the

language to which the adjectives belong. Responses were scored as *inappropriate* when they did not use the correct adjective placement rules. For example, when participants used English adjectives after English nouns or when they used English adjectives after Persian nouns (e.g., table green or miz green), the responses were scored as inappropriate, because in both cases, English adjectives used the syntactic feature of Persian adjectives.

5-2- Results

Overall, 928 sentence fragments consisting of 464 switched and 464 nonswitched sentence fragments were completed by the participants. Twenty-eight (3%) of the responses were scored as "other" and they were discarded from the analysis. Then analysis is based on the remaining 900 sentence fragment completions. Contrary to Experiment 1 and 2 in which the grammar of the other language did not considerably affect participants' responses, much more syntactic interference reported in Experiment 3. The data show that participant used the adjective placement rules from the other language in (28%) of the responses. Inappropriate responses occurred much more frequently (92%) in the switch conditions than in the non-switch conditions (7%). Table 9 shows the participant's responses per condition. The results show that in the switch conditions inappropriate responses occurred much more frequently (65%) from L2 to L1 than from L1 to L2.

Table 9

Experiment 3: Participant's responses in switch and non-switch tasks

LT	**Responses**				
	Sum	Appropriate	Inappropriate	Omission	%Inappropriate
Non-switch tasks	464	441	18	5	%7
Persian	232	215	14	3	%6.03
English	232	226	4	2	%1.72
Switch tasks	464	202	239	23	%92.99
Persian-English	232	142	83	7	%35.77
English-Persian	232	60	156	16	%65.27

Note: LT: Language Task, Omission: responses scored as other, %inappropriate: the percentage of inappropriate responses (responses scored as Other were not included)

Like Experiment 1 and 2, χ^2-tests were conducted to determine model best fit (See Table 10). The results indicated that language task was highly significant ($p < .001$). Adding both language task and target language as predictors improved the model significantly. Then target language affects the

responses when language task is taken into account. No significant effects of language proficiency, self rating of speaking skill and self rating of listening skill were observed.

Table 10

Models of responses in Experiment 3

Predictor	Estimate	Standard Error	z value	*p*
Language Task as main predictor: $\chi^2(1) = 48.51$, $p < .001$, $N = 900$				
(Intercept)	-7.384	0.734	-10.060	< .001
Language Task	3.811	0.420	9.078	< .001

Predictor	Estimate	Standard Error	z value	*p*
Language Task and Target Language as predictors: $\chi^2(1) = 83.747$, $p < .001$, $N = 900$				
(Intercept)	-4.820	0.538	-8.963	< .001
Language Task	3.830	0.284	13.507	< .001
Target Language	-1.737	0.201	-8.630	< .001

The results clearly indicate that participants' responses were affected by the grammar of the other language.

5-3- Discussion

When participants were asked to describe the pictures using both nouns and adjectives from the same language or from the other language in the switch and non switch trials respectively (see Experiment1 and 2), they successfully used the correct adjective placement features of the intended languages in most cases. In other words, the grammar of the other language did not affect participants' use of adjectives significantly. But in Experiments 3, when they were asked to use only adjectives from the other languages in the switch trials, participants were considerably blind to their uses of combinatorial nodes (adjective placement rule). It means that in Experiments 3, adjectives had much less syntactic restrictions to find their positions in noun phrase structures than in Experiment 1 and 2.Participants' choice of combinatorial nodes of adjectives was more volatile in Experiment 3 than in Experiment 1 and 2. The results show that the grammar of the other language affects bilingual language production. Syntactic interference from the non-target language is much stronger under some circumstances than others. While language task had a significant effect on participants' responses, no effects of language proficiency on cross-linguistic influences was observed.

6- General Discussion

The main aim of the experimental studying of CS was to investigate whether the two different grammatical systems of bilingual speakers are entirely kept separate during language production or whether some times the syntactic features of one language (non-target language) affect the production of the other language (target language). It was hypothesized that since the two languages of bilingual speakers are activated during language production, the grammatical system of the non-target language might affect the production of the target language. The results keep in line with the main hypotheses of study. I provided three experiments. In all experiments, I used sentence completion tasks. In each experiment, participants described pictures using a noun and an adjective. While in Experiment 1 and 2 participants used a noun and an adjective from the same language in the non-switch conditions, in the switch conditions, they used a noun an adjective from the other language. In Experiment 3, however, in the switch conditions, they had to use only adjectives from the other language. The results showed that in all experiments the grammatical system of the non-source language affected the production of the target language. However, cross-linguistic influences affected differentially by whether only adjectives were switched or both nouns and adjectives of noun phrases were switched. In Experiment 1 and 2, they *sometimes* used the word order from the other language. In Experiment 3, participants *often* used the adjective placement rule from the other language.

Moreover, it was hypothesized that more inappropriate responses are made in the switch tasks than in the non-switch tasks. The results of the study indicated that in all experiments, inappropriate responses occurred much more frequently in the switch conditions than in the non-switch conditions. Participants significantly made more inappropriate responses (i.e., they used the correct word order of the target language) in the switch conditions than in the non-switch conditions.

No effects of proficiency on cross-linguistic influences were predicted in Hartsuiker et al.'s (2008) integrated model. The results of the present study are consistent with the model's prediction that in all experiments, the inappropriate responses were not affected by participants' levels of language proficiency.

The results of the present study shed lights into our understanding of bilingual language production. In sum, the results demonstrated that the syntactic feature of the other language interferes bilingual language production. In addition, the data showed that a bilingual speaker has access to the syntax of the other language. The data here indicated that both languages are co-activated in bilingual language production and bilingual speakers sometime use the grammar of one language and the words from the other language.

6- 1- Why different results?

The results of Experiment 1 and 2 showed that participants were considerably successful in selecting the appropriate combinatorial nodes and this led to producing very few inappropriate responses(1.60%) in both switch and non-switch conditions. In marked contrast to Experiments 1 and 2, the grammar of the other language affected the use of adjectives much more significantly (28%) in Experiment 3 than in Experiment 1 and 2. What implications do the results of the present study have for language processing in bilingual speakers? Three different assumptions might be made about the different results between Experiments 1 and 2 and Experiment 3.

One assumption is that in the present study, different experimental contexts led to different patterns of control mechanism in bilingual language processing, because as Green (2011) states, differences in experimental contexts lead to differences in neural loci at which lexical items from the target language can be selected. The other assumption is that different experimental contexts led to different strength between the nodes at different levels of language production. According to the second assumption, the external instructions given to bilingual speakers or the external expectations of language production (See Green, 2011) might lead to changes in the strength between the nodes within the network. In other words, different contexts may impose different strength between the nodes. The pattern of strength between the nodes may vary depending on the context in which languages are used. In experimental studies it may vary according to the instructions given to the participants. A third assumption is that a combination of different patterns of strength between the nodes and different patterns of the control mechanism might lead to different linguistic behavior of a bilingual speaker.

I assume that the strength between the nodes at different levels might not be the same in all language processing conditions. Some external factors may affect the strength between the nodes. The motivation behind the assumption is that as the results indicated, language task had a significant effect on participants' responses. The results keep in line with Abutalebi and Green(2008) that the precise way in which the control network operates in bilingual language processing will depend on the language task. Thus consistent with Green's(2011) suggestion that "different contexts impose a different load on components of the control circuit"(p.1), the results suggest that there might be a different language processing or a different control mechanism between a context where a bilingual speaker is asked to switch both nouns and the adjectives of noun phrases and a context where a bilingual speaker is instructed to switch only the adjective of noun phrases. As I stated above, the pattern of strength between the nodes and/or the pattern of the control mechanism (Abutalebi and Green, 2008) may change depending on the language task or the context in which a bilingual speaker uses the two languages. When they were asked to use only adjectives from the other language, they shaped the link between adjectives and the combinatorial nodes much more freely than when they were asked to use both nouns and adjectives from the same or from the other language. This accords

with Hatzidaki, Branigan and Pickerings' (2011) finding that bilingual speakers activate the non-source language nodes more strongly under some conditions. The researchers report that some specific contexts increase activation of the non-target language node.

6-2- NP structure in Hartsuiker and Pickering's (2008) integrated model of syntactic representation

Now I consider how the results of the present study might be captured within a model of adjective-head noun/head noun-adjective in bilingual language production and how such a model might be integrated with Hartsuiker and Pickering's (2008) integrated model of syntactic representation. Below an outline of the model is given first, followed by a description of the results within a model of adjective-head noun/head noun-adjective in bilingual sentence production. Finally I examine how such a model might be integrated with Hartsuiker and Pickering's (2008) integrated model.

According to Hartsuiker and Pickering's (2008) model, bilingual speakers have an integrated lemma stratum. It is assumed that lemmas - the base form of each word- from the two languages are represented in an integrated network. Each lemma node (e.g., *red* in English or *qermz* in Persian) is linked to one conceptual node (RED(X,Y)) at the conceptual stratum, to one category node (e.g., Adjective), to combinatorial nodes (e.g., Prenominal or postnominal adjective), and to one language node(e.g., English, Persian) in their integrated network. According to the model, category nodes specify grammatical categories (e.g., adjective) and combinatorial nodes specify different kinds of syntactic structures in which a word can be used, Bernolet et al. (2007). The integrated network includes shared syntax and lexicon. Some syntactic representations are shared between languages. Such syntactic structures can be linked to lemma nodes from both languages, while other structures are not shared between languages and therefore they can only be linked to lemma nodes from one language only(Hartsuiker, et al.,2004; Kootstra et al., 2012).

Cross-linguistic grammatical effects and lexical switching are predicted in this model, because according to this account, both meaning and syntax of the words are points of contact across languages, Hartsuiker, et al. (2004). Thus, according to the model's prediction it is possible that a Persian-English bilingual speaker selects a Persian construction (e.g., a noun-adjective word order string) when speaking in monolingual mode in English. However, no effect of language proficiency on cross-linguistic influences was predicted by the model(Hartsuiker and Pickering, 2008). While syntactic transfer in bilingual language production was captured by Hartsuiker and Pickering's (2008) integrated model, save for Kootstra, et al. (2010); Kootstra (2012b), Hatzidaki, Branigan and Pickerings' (2011), and Selles(2011) it has not yet been experimentally tested on CS.

In order to incorporate findings of the study into the Hartsuiker and Pickering's (2008)model, first I consider bilingual lexical processing in noun phrase structures based on the model. In the switch trials in Experiment 1 and 2 participants had to use nouns and adjectives from the other language. In the non-switch trials, however, nouns and adjectives had to be selected from the same language. The same processing exists in Experiment 3 except that in the switch trials, participants had to use only adjectives from the other language. Thus, what is common in all Experiments is that producing responses involves activating the appropriate noun lemma together with a) its category information-noun-, b) its featural information,(e.g., singular/plural), and activating the appropriate adjective lemma together with a) its category information-adjective-, and b) its combinatorial information(prenominal/postnominal).

According to the model, when a Persian-English bilingual speaker intends to produce " Pirahan siah"(black shirt), the concept of "Pirahan siah" sends activation to the Persian lemma " Pirahan"(shirt) and "siah"(black). Since the concept is shared between the two languages, it also sends activation to the English lemmas, "black" and "shirt" to a lesser degree. In my experiments, adjectives had different combinatorial nodes across the two languages.

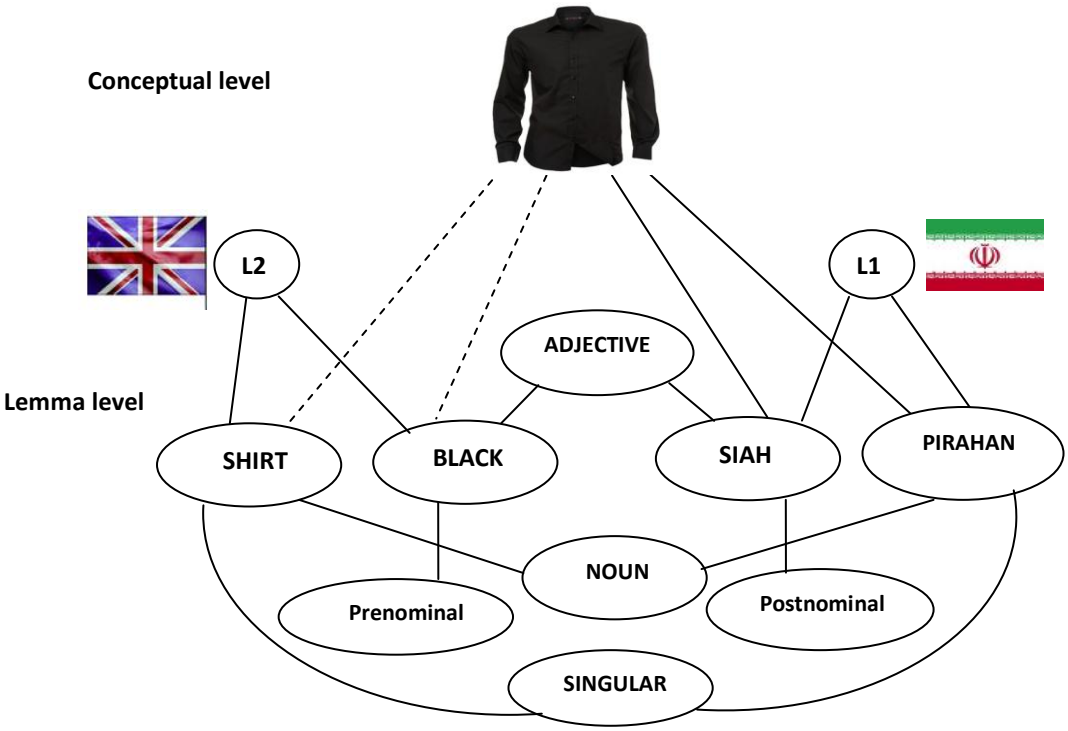


Fig. 1. A model of adjective-head noun/head noun-adjective in bilingual sentence production integrated with Hartsuiker, Hartsuiker and Pickering's (2008) integrated model of syntactic representation. The concept of " Pirahan siah" sends activation to the Persian lemma " Pirahan and " siah". The concept also sends activation to the English lemmas, "black" and "shirt" to a lesser degree. "Siah" is linked to the Persian node, the conceptual node "SIAH", and the postnominal adjective node. "Black" is linked to the English node, the conceptual node "BLACK", and the prenominal adjective node. Both " Pirahan" and " shirt" are linked to the same category node(noun) and featural node(singular).

Thus, according to the model, “siah” is linked to the Persian node, the conceptual node “SIAH”, and the postnominal adjective node. “Black” is linked to the English node, the conceptual node “BLACK”, and to the prenominal adjective node(see Fig.1). Both “ Pirahan” and “ shirt” are linked to the same category node(noun). As stated above, when a Persian-English bilingual speaker intends to produce “siah”, first he activates the conceptual node “SIAH” and the Persian language node. Then activation spreads to the “siah” lemma and the postnominal node. According to the model, the “SIAH” conceptual node activates the “black” lemma, but since the “black” lemma receives little support from the language node (Persian), activation of this lemma- belonging to the other language- is weaker. But even little activation of “black” leads to the activation of prenominal node to a lesser degree, Hatzidaki, Branigan and Pickerings (2011). In other words, while a Persian-English bilingual speaker normally uses “siah” following nouns (i.e., he uses the postnominal combinatorial node), sometimes he may use “siah” before a noun(i.e., he uses the prenominal combinatorial node).

The non-target language node is activated more strongly under some conditions especially in bilingual contexts where a bilingual speaker has recently used the non-target language (Hatzidaki, Branigan and Pickering, 2011). Bilinguals’switching back and forth between the two languages has a critical role in increasing activation of the non-target language lemmas and the syntactic information (i.e., featural and combinatorial information) associating with them. In adjective case, this leads to using the combinatorial node from the other language(see Fig. 2).

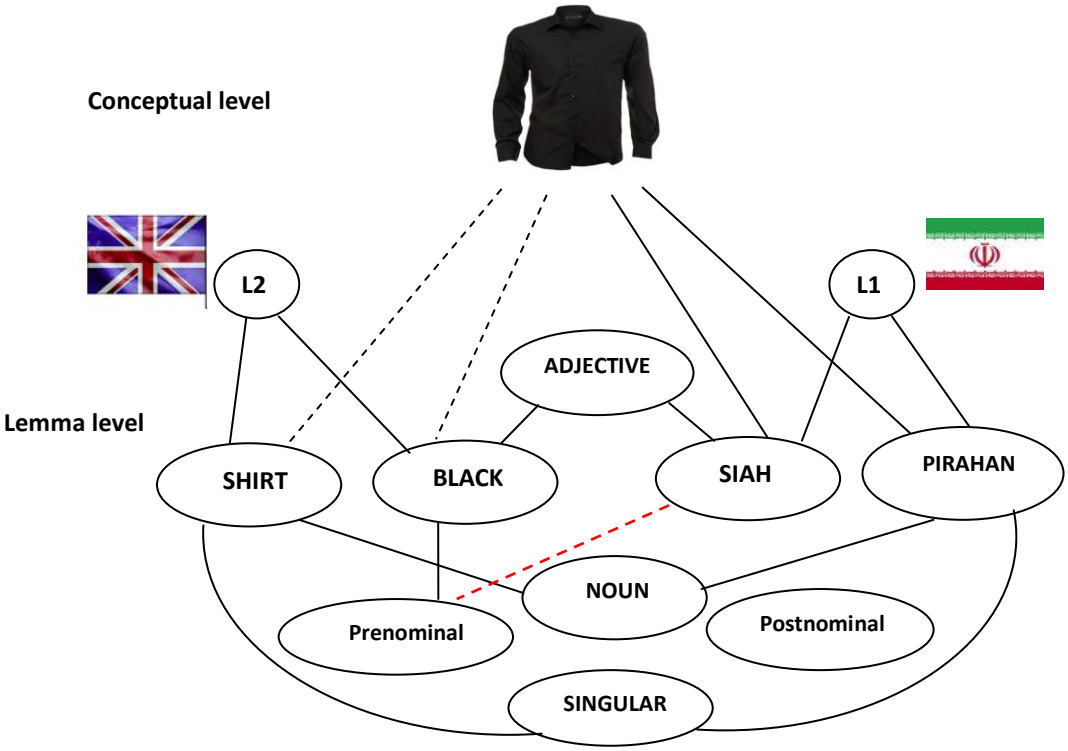


Fig.2. A model of syntactic interference inside NP structure. The dotted red line shows the momentary link between a Persian adjective with the combinatorial node of the other language(English).

6-3- Switch directions

One of the issues that has been investigated in bilingual language production study is whether there is any difference in processing between switches from L1 to L2 and vice versa. In the present study, (78%), (89%), and (65%) of the inappropriate responses in Experiment 1, 2, and 3, respectively occurred in switches from L2 to L1. The results of the study are consistent with Meuter and Allport (1999); Meuter (1994). Meuter and Allport (1999) reported that when a bilingual speaker switches, the cost of switching(RT) is greater when he switches from his L2 to his L1 than vice versa. In other words, switching in bilingual language production follows from asymmetric switching costs. According to Meuter (1994) and Meuter and Allport (1999), the asymmetric switching cost account or the paradoxical pattern account assumes that in the switch utterances when the intended response language is the participants' L1, we expect much stronger recording of the distractor (See Meuter, 2005) or we expect much more inappropriate responses than when the intended response language is the participants' L2. The results of the study are in line with Meuter and Allport (1999) and Meuter(1994) that more responses (59%) scored as "other" occurred in switches from L2 to L1. The results suggest that switches from L2 to L1 are more costly than vice versa. Participants had more difficulty making appropriate responses in switches from L2 to L1 than from their L1 to L2, because bilingual speakers experience much more difficulty when they have to "suppress a resulting inappropriate response"(Meuter, 2005:355) in their L1. According to Meuter and Allport (1999) the reason for the paradoxical pattern in the switch conditions is that in non-balanced bilingual speakers, the inhibition of their L1 is considerably powerful. So, the cost that arises from its removal is considerably large (See Green, 1993; 1998). To connect the Hartsuiker et al.'s (2004) integrated model of syntactic representation model with Meuter and Allport's(1999) findings, as the data here show, in switches from L2 to L1, participants had more difficulty reactivating the combinatorial node(prenominal) of Persian. This resulted in more inappropriate responses in switches from L2 to L1. Accordingly, the reason why less inappropriate responses observed in switches from their L1to L2 is that speaking in L1 requires little active inhibition of L2 (Meuter and Allport ,1999) and therefore in switches from L1 to L2 participants needed less effort to reactivate their L2 language. It means that in comparison with L2, L1 needs more impulses to be re-activated (Paradis, 1993, 2004; Green,1986). In the switch conditions, this leads to more inappropriate responses from L2 to L1 than vice versa(See Abutalebi and Green, 2008, for a review of studies on switch cost). In the same vein, the reason why less inappropriate responses observed in switches from L1(Persian) to L2 (English) than from L2 to L1 is that in the former participants needed less effort to activate the combinatorial information of their L2 language(English), because their L2 language was not inhibited as powerful as their L1 language.

7- Conclusion

My experiments found that bilingual speakers sometime use the grammar of one language and the words from the other language. Activation of the combinatorial node from the non-source language affects the syntactic process of word order in NP structures in the source language. The findings of the present study keep in line with interference accounts of syntactic processing in bilinguals' language production and the parallel activation of the two languages during language production. In his language production, a bilingual speaker may use a combinatorial node from the other language. More syntactic interference occurred in the switch tasks in which the two languages of a bilingual speaker are involved to a greater degree. Most of the inappropriate responses were produced in switches from L2 to L1 than from L1 to L2. While language proficiency did not put effects on responses, language task and target language significantly affected participants' responses.

References

- Abutalebi, J., and Green, D. W., (2008). Control mechanisms in bilingual language production: neural evidence from language switching studies. Language and Cognition Process. 23, 557–582.
- Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2007). Shared syntactic representations in bilinguals: Evidence for the role of word-order repetition. Journal of Experimental Psychology: Learning, Memory, and Cognition, 33, 931–949.
- Blom,J. and Gumperz.J.J.,(1972).Social meaning and Linguistics structures, code-switching in Northern Norway, In Gumperz, J.J. and Hymes, D. (eds.) Directions in Sociolinguistics: The Ethnography of Communication, 407-434, New York: Holt, Rinehart and Wilson
- Bob, S.C., Hoshino, N. and Kroll, J.F., (2008). The role of language clues in constraining cross-language activity. EUROSLA yearbook 8, 6-31.DOI 10.1075.
- Bock, J. K. (1996). Language production: Methods and methodologies. Psychonomic Bulletin & Review, 3 (4), 395-421.
- Branigan, H.P., Pickering, M.J., & Cleland, A.A. (2000). Syntactic co-ordination in dialogue. Cognition, 75, B13–B25.
- Broersma, M. (2011). Triggered code-switching: Evidence from picture naming experiments. In M. S. Schmid & W. Lowie (Eds.), Modeling Bilingualism From Structure to Chaos: In Honor of Kees de Bot. Amsterdam: John Benjamins. 37-57
- Bullock, B,E., and Toribio, A.J., (2009). Themes in the study of code-switching. In B.E. Bullock and A.J., Toribio. The Cambridge Handbook of Linguistic Code-switching. Cambridge University Press.1-17.
- Carammazza, A., (1997). How many levels of processing are there in lexical access?. Cognitive Neuropsychology, 14, 177-208.
- Carota F, Posada A, Harquel S, Delpuech C, Bertrand O, Sirigu A. (2009). Neural Dynamics of the Intention to Speak. Cereb Cortex, 20(8):1891-7
- Costa, A., Roelstraete, B., & Hartsuiker, R. J. (2006). The lexical bias effect in bilingual speech production: Evidence for feedback between lexical and sublexical levels across languages. Psychonomic Bulletin & Review, 13, 972–977.
- Costa, A., (2005). Lexical access in Bilingual production In J.F. Kroll. & A. M. B., De

Groot. (eds.). The Handbook of bilingualism. Psycholinguistic Approaches.309- 325.

- Costa, A., & Santesteban, M. (2004). Lexical access in bilingual speech production: Evidence from language switching in highly proficient bilinguals and L2 learners. Journal of Memory and Language, 49, 491–511.
- de Bot, K. & Schreuder, R. (1993). Word production and the bilingual lexicon. In R.Schreuder & B. Weltens (Eds.), The Bilingual Lexicon Amsterdam: Benjamins.191-214.
- de Bot, K. (1992). A bilingual production model: Levelt's 'Speaking' model adapted. Applied Linguistics, Desmet, 13, 1–24.
- De Houwer, A., (2006). Bilingual Language Development: Early Years. In K. Brown (Ed.), Encyclopedia of language and linguistics (2nd ed.). Oxford: Elsevier.
- Dell, G.S., (1986). A spreading activation model of retrieval in sentence production. Psychological Review, 93, 283-321.
- Green, D.W., (2011). Language control in different contexts: the behavioural ecology of bilingual speakers, Frontriers in Psychology, Volume 2, Article 103
- Green, D.W., (1998). Mental control of the bilingual lexico-semantic system. Bilingualism: Language and cognition.1, 67-81.
- Green, D. W., (1986). Control, activation and resource. Brain and Language, 27, 210-223.
- Green, D. W., (1993). Towards a model of L2 comprehension and production. In R. Schreuder & B. Weltens (Eds.), The bilingual lexicon (pp.249-277). Amsterdam/ Philadelphia: John Benjamins Publishing Company.
- Gross, S.,(2006).Code Switching. In K. Brown (Ed.), Encyclopedia of language and linguistics (2nd ed.). Oxford: Elsevier.
- Grosjean, F., (1998). Living with Two Languages and Cultures." In: Ila Parasnis, ed. Cultural and Language Diversity and the Deaf Experience. Cambridge: Cambridge University Press. 20-37.
- Hamers, J.F. and Blanc, M.H.A. (1989), Bilinguality and Bilingualism, revised edn, Cambridge, Cambridge University Press, originally published in French as Bilingualité et bilinguisme, Liège, Brussels, Márdaga.
- Hartsuiker, R.J., & Pickering, M.J., (2008). Language Integration in bilingual sentence production. Journal of Experimental psychology, 479-489.

- Hartsuiker, R.J., Schoonbaert, S., & Pickering, M.J. (2006). Lexical and syntactic access in bilingual language production. In J. Morais & G. d'Ydewalle (Eds.) Bilingualism and second language acquisition . Brussels: Royal Academies for Science and the Arts of Belgium. 55- 68.
- Hartsuiker, R. J., Pickering, M. J., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish-English bilinguals. Psychological Science, 15, 409–414.
- Hatzidaki,A., Branigan,H. and Pickering, M.J.,(2011)." Co-activation of syntax in bilingual language production". Cognitive psychology. 62, 123-150.
- Karousou-Fokas, R., & Garman, M. (2001). Psycholinguistic interpretation of codeswitching: Evidence from fluent Greek–English bilingual adults. International Journal of Bilingualism, 1, 39-69.
- Kootstra, G. J., van Hell, J. G., & Dijkstra, T. (2012). Priming of code-switching in sentences: The role of lexical repetition, cognates, and proficiency. Bilingualism: Language and Cognition. 1-23.
- Kootstra, G. J. (2012b). Code-switching in monologue and dialogue: Activation and alignment in bilingual language production. Doctoral Dissertation. Radboud University Nijmegen.
- Kootstra,G.J., van Hell,J.G. and Dijkstra.T., (2010). Syntactic alignment and shared word order in code-switched sentence production: Evidence from bilingual monologue and dialogue. Journal of Memory and Language ,63, 210-231.
- Kroll, J, F., Bobb, S., C., Misra, M. and Gue, T., (2008). Language selection in bilingual speech: Evidence for inhibitory process, ActaPsychologica
- Kroll, J., F., Bobb, S., C., Wodnecka, Z.,(2006). Language selectivity is the exception, not the role: Arguments against a fixed locus of language selection in bilingual speech. Language and Cognition 9(2), 119-135.
- La Heij, W. (2005). Selection processes in monolingual and bilingual lexical access. In J. F. Kroll & A. M. de Groot (Eds.), Handbook of bilingualism: Psycholinguistic approaches. New York: Oxford University Press. 289-307.

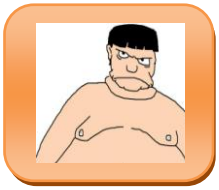
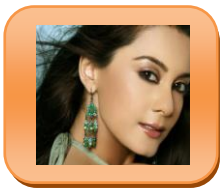
- Levelt. J.M., (1999). Models of word production. Trend s in Cognitive sciences. Vol,3.No.6
- Levelt. J.M., (1989).Speaking from intention to Articulation. Massachusetts Institute of Technology.
- Loebell, H., & Bock, K. (2003). Structural priming across languages. Linguistics, 41, 791-824.
- McClure, E.,(1981). Formal and functional aspects of the codeswitched discourse of bilingual children. In Duran R.P.(ed.) Latino language and communication behavior, Norwood, N.J: ABLEX Publishing Corporation.69-94.
- Meuter. R. F. I., (2005) Language Selection in Bilinguals: Mechanisms and Processes. Handbook of Bilingualism: Psycholinguistic Approaches, 349-370.
- Meuter, R. F. I., & Allport, A. (1999). Bilingual language switching in naming: Asymmetrical costs of language selection. Journal of Memory and Language, 40, 25–40.
- Meuter, R. F. I., (1994). Language switching in naming tasks. Unpublished doctoral dissertation, University of Oxford, Oxford, U.K.
- Myers-Scotton, C., (2002). Contact linguistics: Bilingual encounters and grammatical outcomes. New York: Oxford University Press.
- Myers-Scotton, C., (1993). Duelling languages: Grammatical structure in codeswitching. Oxford: Clarendon Press.
- Nilep,C.,(2006).Codeswitching in sociocultural Linguistics, Colorado Research in Linguistics, Volume 19.
- Paradis, M., (2004), A Neurolinguistic Theory of Bilingualism', Amsterdam, John Benjamins.
- Paradis, M., (1993). Linguistic, psycholinguistic, and neurolinguistic aspects of interference in bilingual speakers: The Activation Threshold Hypotheses . International Journal of Psycholinguistics, 133-145.
- Pickering, M. J., & Ferreira, V. S. (2008). Structural priming: A critical review. Psychological Bulletin, 134, 427–459.
- Pickering, M.J., Branigan, H.P., Cleland, A.A., & Stewart, A.J. (2000). Activation of syntactic information during language production. Journal of Psycholinguistic Research,

29, 205-216.

- Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: evidence from syntactic priming in language production. Journal of Memory and Language, 39, 633–651.
- Schwartz, A. I., Kroll, J. F., & Diaz, M.,(2007). Reading words in Spanish and English: Mapping orthography to phonology in two languages. Language and Cognitive Processes, 22, 106-129.
- Schwartz, A. I., & Kroll, J. F., (2006). Language processing in bilingual speakers. In M. J. Traxler & M. A. Gernsbacher (Eds.), Handbook of psycholinguistics (2nd ed.). Amsterdam; Boston: Elsevier/Academic Press. 967-999.
- Selles, A.(2011). Cross-linguistic interference in the production of adjective and noun word order by Spanish-English bilinguals, Master's theses, University of Edinburgh
- Sobin, N., J., (1984). On code-switching inside NP. Applied Psycholinguistics, 5, 293-303
- Ullman, M. T. (2001). The neural basis of lexicon and grammar in first and second language: The declarative/procedural model. Bilingualism: Language and Cognition, 4, 105-122.

APPENDIX A

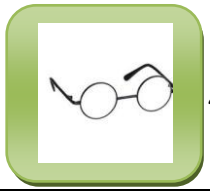
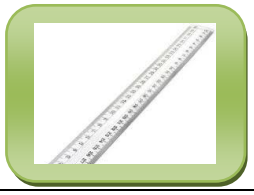
Items of English set used in Experiment 1

Judy carried the  for me.	The doctor examined the  last night.
She wanted to kiss the  goodbye.	We had three  on holiday
I saw a  breaking the door.	Use the cream for your  every day
Roly was dating a  last night	They live on the  out of town
There is a  on the kettle.	The zoo is full of  from Africa.
George needs a line  to rule the	Dale is wearing  today.
He pulled a  off the bunch	Sam climbed the  last summer.
Kathryn was wearing a party.  at the	A woman with  the street was walking in

Albert gave change to the street  in the	Jack is an  isn't he?
We passed over a  hurriedly.	Toni eats  every morning
Ted prefers her tea in a saucer  and	That man could not lift the yesterday 
That cat jumped over the quickly. 	She was sleeping on a  in the same room
Robert wants to wash his water  with	I saw a  among the crowd
Mariel cut her finger with a the kitchen  in	Ted could not run with a  at all.
We will have a  today	Omid is wearing a  today.
They can't catch the  easily.	A woman with the street  was walking in

APPENDIX B

Items of Persian set used in Experiment 1

مینا  رو برام آورد	دکتر  رو معاینه کرد
نسرین می خواست برای خداحافظی  رو ببوسه.	در یک  به چتر نیاز داری
این صندلی برای یه  مناسب نیست	این کرم برای  مناسبه
شاهین با یه  قرار داره	به نظر، یه  هست
باغ وحش پر از  هست.	یک  روی کتری هست.
رامین یه  خرید	حسین به یک  نیاز داره
پارسال از اون  بالا رفتند.	اونها  رو خوردند.
این دختر  داره.	مریم یه  پوشید

توی این  چیزی نمی شه گذاشت	اونها نمی تونن اون  رو بگیرند
امید به  پوشید	امروز یه  داریم.
علی یه  هست	مهدی به  پول داد.
سهیل هر روز صبح یه  می خوره	ما با عجله از یه  رد شدیم
بهروز چای رو تو یه  خورد	اون مرد نتونست اون  رو بلند کنه.
گربه از روی یه  پرید	شهرام روی یه  خوابیده بود.
حسین می خواد  رو بشوره	اون واقعاً یه  هست.
سعید دستش رو با یه  برید	حامد نمی تونست با یه  بدود

APPENDIX C

List 1 of items used in Experiment 2

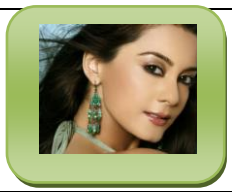
Mr Green met a  last night	**red shoes** She bought the  yesterday.
Small bucket Sherry filled the  with water	بالاخره تونست اون  رو جابجا کنه
Thank you, We had  last night	**Tight skirt** The lady was wearing a  at the party
جوراب کثیف نباید  رو روی زمین بندازی	**narrow street** There are very village  in the little
hot tea I prefer  to water.	**غذای تند** اصلا نمی تونم  رو بخورم
expensive necklace Thomas bought Sarah birthday  for her	Today the  was seen in the street.
دستکش چرمی امروز میترا  رو نپوشید	Lily cut herself on the  in the kitchen
کاغذ نازک نامه را روی یک  نوشت	بهمن از روی یه  افتاد

مرد زشت هیچ کی او  رو دوست نداشت	The boys were swimming in the yesterday 
دوست نداره او  رو بفروشه	پدربزرگش همیشه روی  می نشست
مرد جوان پیر زن دوست داره با ی  ازدواج کنه	ای  تو تابستون می چسبه
هیچ کس دوست نداره تو این  راه بره	**اتاق تاریک** امیر ا  بدش می آد
از او  خیلی می ترسه	**دختر کوتاه قد** اون روز یه  بهش کمک کرد
These are not  for wedding	**big spot** Birdie has got a  on her face.
کارگر  را محکم گرفت	Last night a  scurried across the floor
The boy had a  in his hand	**Round table** There was a  in the dining room

APPENDIX D

Items used in Experiment 3

توی تابستون  خیلی می چسبه.	I saw a  breaking the door.
They always read  at weekends	ماهیگیر امسال یه  شکار کرد.
We've had a  this year.	Dale is wearing  today.
The zoo is full of  from Africa.	این دختره یه  پوشیده
داره  این قابلمه یه	نسرین می خواست اون  رو ببوسه
They live on the  out of town	George needs a line  to rule the
خوردیم  دیشب تو عروسی،	کاشتند  وسط حیاط یه
I can't move the  without any help	A woman with the street  was walking in

حامد نمی تونست با یه  بدود	امروز امید یه  پوشید
Mariel cut her finger with a  in the kitchen	That cat jumped over the  quickly.
حسین می خواد با آب،  ش رو بشوره	شبنم از آرایشگاه با  برگشت
اصلاً وقت ندارم  رو بخونم	امیر امشب با یه  قرار داره
Ted prefers her tea in a  and saucer	ما باعجله از یه  رد شدیم
The doctor used to eat  every morning	That man could not lift the  yesterday
Jack is an  isn’t he?	توی این  چیزی نمی شه گذاشت
Albert gave change to the  in the street	شهرام توی اون اتاق روی یه  خوابیده بود

APPENDIX E

English language proficiency Test

Fill in the blanks with the most appropriate words.

Switzerland is a federal republic (1)**.....** of 26 cantons. The country is(2) **.....** in western Europe, where it is (3) ..... by Germany to the north, France to the west, Italy to the south, and Austria and Liechtenstein to the east. The Swiss(4) ..... of approximately 8 million people is (5)..... mostly on the Plateau, where the largest cities are to be found.

The Swiss Confederation has not been in a state of war internationally since 1815 and did not (6)..... the United Nations until 2002. It (7) ....., however, an active foreign policy and is frequently(8) ..... in peace-building processes (9)..... the world. Switzerland is also the (10) ..... of the Red Cross and home to a large (11) ..... of international organizations.

Switzerland is one of the richest countries in the world and has the highest(12) ..... per adult of any country in the world. Zurich and Geneva have been (13) ..... as the cities with the second and third highest(14) ..... of life in the world. Switzerland's most important economic (15)..... is manufacturing. Manufacturing consists largely of the production of specialist chemicals, health and pharmaceutical (16)..... Around 3.8 million people work in Switzerland and the unemployment (17) ..... is very low. Population(18) ..... from net immigration is quite high, at 0.52% of population in 2004.

The Swiss (19) ..... is generally temperate, but can (20)..... greatly between the localities. Summers (21)..... to be warm and humid at times with periodic rainfall. A weather (22) ..... (known as the föhn) can (23)..... at all times of the year and is characterised by an unexpectedly warm wind.

Switzerland (24)..... alliances that might entail military, political, or direct economic action and had been neutral since the end of its expansion. Its policy of neutrality was internationally(25) ..... at the Congress of Vienna in 1815.

Source: Wikipedia, Switzerland